

**REMARKS****Claim Amendment**

Claims 32, 33 and 35 have been amended to address the objections raised by the Examiner. Claims 32 and 33 have been amended to amend typographical errors. Claim 35 has been amended to insert the word “further” before the element of phosphonic acid.

No new matter has been added.

**Examiner’s Interview**

A telephonic Examiner’s interview took place on April 17, 2007. Applicants were represented by Alexander Akhiezer. USPTO was represented by Examiners David Wu and Michael Bernshteyn. Parties discussed the outstanding rejections under 35 U.S.C. §§102(a), 103(a), and 112.

Examiners agreed that if it were shown that the conducting polymeric materials of the present invention are different from the conducting polymeric materials disclosed by US2004/0062969 (“Sakaguchi”), then the outstanding claim rejections would be overcome. Applicants agreed to file a Declaration under 37 C.F.R. 1.132 describing the differences between the materials of the present invention and those of Sakaguchi.

Applicants also noted that Claims 25 and Claim 44 contain a special technical feature (the material produced in a sequence of steps (a), (b) and (d) of Claims 25 and 44) that is novel in view of the prior art. As such, if it were shown that the material of the present invention is novel in view of Sakaguchi, the restriction requirement would be improper and should be removed.

**Claim Objections**

The Examiner objected to Claims 32 and 33 due to typographical errors. Applicants amended Claims 32 and 33 accordingly.

The Examiner objected to Claims 35-37 and 51 as lacking antecedent basis for the recitation of a vinyl-containing phosphonic acid. Applicants amended Claim 35, on which Claims 36, 37 and 51 depend to recite “further” before “comprises”.

Applicants believe that these amendments address the Examiner’s objections.

Claim Rejections Under 35 U.S.C. §112

The Examiner maintained his rejection of Claims 25, 38-40 and 50 as failing to comply with the enablement requirement. The Examiner is again asserting that vinyl-containing monomer, present in the mixture formed in step (a) of Claims 25 and 44, is depleted during the polymerization reaction recited in step (b) of Claims 25 and 44 and is, therefore, unavailable for the polymerization reaction recited in step (d) of Claims 25 and 44.

As Applicants already explained in their Amendment and Reply to Restriction Requirement submitted on September 14, 2006, this rejection is based on misapprehension of the chemical reactions recited in Claims 25 and 44. Specifically, the Examiner appears to be under erroneous assumption that the vinyl-containing monomers present in the original mixture formed in step (a) take part in the polymerization reaction recited in step (b). As Applicants stated earlier, step (b) and step (d) of Claims 25 and 44 recite two different chemical reactions, having two different starting materials.

To further support this assertion, Applicants submit herewith a Declaration by Dr. Thomas J. Schmidt, an expert in the field, under 37 C.F.R. 1.132 ("The Schmidt Declaration").

Section 4 of the Schmidt Declaration states that the process by which a proton-conducting material of the present invention (such as the membrane of Claim 25 or the coating of Claim 44) are made comprises preparation of two distinct polymers: a polyazole polymer and a polyvinyl polymer, so that resulting material is a mixture of two different polymers.

Section 5 of the Schmidt Declaration explains that the process begins with mixing the starting materials for the two subsequent polymerization reactions. The starting materials for the polyazole polymer include aromatic or heteroaromatic compounds having one or more amino groups and one or more carboxylic acid groups, and the starting materials for the polyvinyl polymer include vinyl-containing sulfonic and/or vinyl-containing phosphonic acids.

Section 6 of the Schmidt Declaration explains that the polyazole polymer is prepared by a condensation reaction between amino substituents and carboxylic substituents on the aromatic or heteroaromatic compounds, while the vinyl-containing component of the original mixture remains unaffected by this reaction.

Section 8 of the Schmidt Declaration explains that the final step of the process is polymerization of vinyl-containing sulfonic or phosphonic acid by a free-radical polymerization mechanism, whereby the polyazole component of the proton-conducting material, formed at a previous step by condensation reaction, remains unaffected.

In summary, the vinyl-containing component of the original mixture of step (a) of Claims 25 and 44 is neither depleted nor even affected by the condensation reaction recited in step (b), in which polyazole polymer is formed. Accordingly, the rejection under 35 U.S.C. §112 is improper and should be withdrawn.

Reconsideration and withdrawal of the rejection are respectfully requested.

Claim Rejections Under 35 U.S.C. §102(a)/103(a) over Sakaguchi

The Examiner rejected Claims 25-27, 33 and 41-43 under 35 U.S.C. §102(a) or, in the alternative 35 U.S.C. §103(a) as being anticipated by, or, in the alternative, as being obvious over Sakaguchi (US2004/0062969).

The Examiner stated that Sakaguchi discloses a polybenzazole compound having sulfonic acid group and/or phosphonic acid group useful as a solid polymer electrolyte membrane. Noting that Claim 25 is a product-by-process claim, the Examiner stated that it is his position that Sakaguchi discloses the same product as the product of Claim 25, thus anticipating Claim 25.

Sakaguchi discloses a polybenzazole compound having sulfonic acid groups and/or phosphonic acid groups. Sakaguchi *fails* to disclose a conducting polymeric material claimed by Claims 25 and 44 of the instant invention because (i) Sakaguchi discloses a single polymer, rather than a mixture of two polymers; and (ii) the polymer of Sakaguchi includes acid groups on polybenzazole polymer, while the polyvinyl component of the material of the present invention that includes acidic moieties.

To further support this assertion, Applicants again refer to the Schmidt Declaration.

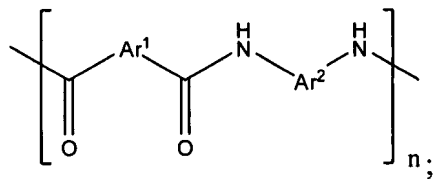
As stated in Section 4 of the Schmidt Declaration, the method recited in Claims 25 and 44 comprises preparation of two distinct polymers: a polyazole polymer and a polyvinyl polymer. The resulting material is, therefore, a mixture of two different polymers.

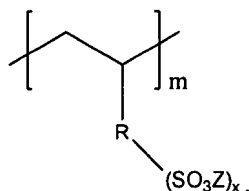
As stated in Section 5 of the Schmidt Declaration, step (a) of Claims 25 and 44 recites mixing the starting materials for the two subsequent polymerization reactions. The starting materials for the polyazole polymer include aromatic or heteroaromatic compounds having one or more amino groups and one or more carboxylic acid groups. (See exemplary compounds listed on pages 13-15 of the English translation of the present application.) The starting materials for the polyvinyl polymer include vinyl-containing sulfonic acids and/or vinyl-containing phosphonic acids.

As stated in Section 6 of the Schmidt Declaration, following the step of mixing, the polyazole polymer is prepared by a condensation reaction between amino substituents and carboxylic substituents on the aromatic or heteroaromatic compounds, recited in step (b) of Claims 25 and 44. (See page 26, lines 22-29 of the English translation of the present application. Examples of resulting polymers are listed on pages 16-19 and pages 22-26 of the English translation of the present application.) The vinyl-containing component of the original mixture remains unaffected by this reaction.

Following shaping the material in step (c) of Claims 25 and 44 (Section 7 of the Schmidt Declaration), the polyvinyl polymer is formed by a free-radical polymerization process which may be facilitated by addition of a free-radical initiator, as explained in Section 8 of the Schmidt Declaration. The polyazole component of the proton-conducting material, formed at a previous step by condensation reaction, remains unaffected by the free-radical polymerization of vinyl-containing monomers. (See page 31, lines 10-21, and on page 32, line 16 through page 33, line 5 of the English translation of the present application.)

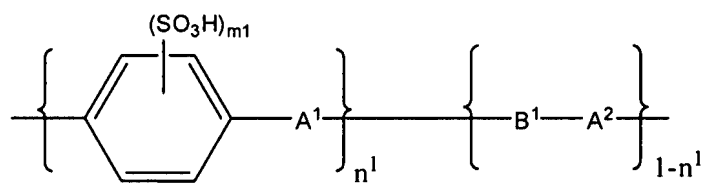
Section 9 of the Schmidt Declaration states that the proton-conducting material membranes of coating produced by the process described above comprises two different polymers: polyazole and polyvinyl. Section 9 provides non-limiting examples of each type of polymers:





(See Section 9 for the definition of variables  $\text{Ar}^1$ ,  $\text{Ar}^2$  and  $\text{R}$ .) The two polymeric materials form a physical mixture, but are not chemically bonded.

Section 10 of the Schmidt Declaration states that the polymer of Sakaguchi is represented by formulas (1) – (2), reproduced below:



From the definitions of variables  $\text{A}^1$ ,  $\text{A}^2$  and  $\text{B}^1$ , provided in paragraphs [0127] through [0129] of Sakaguchi, it follows that variables  $\text{A}^1$  and  $\text{A}^2$  represent “azol” moieties, and variable  $\text{B}^1$  is an aromatic moiety. Thus, the compound of Sakaguchi does not have vinyl-containing units substituted with sulfonic and/or phosphonic acid moieties. Rather, the acidic functionalities of Sakaguchi are attached to an aromatic moiety.

It follows from the above that the proton-conducting material of Claims 25 and 44 is both physically and chemically distinct from the polymer disclosed by Sakaguchi. First, the material of the present invention is a physical mixture of two polymers. Sakaguchi discloses a single polymer, not a mixture. Second, one of the two polymers that comprise the proton-conducting material of the present invention is a polyvinyl substituted with an sulfonic and/or phosphonic acid moiety. The polymer of Sakaguchi does not comprise vinyl units; sulfonic and/or phosphonic functionalities are attached to an aromatic moiety.

Accordingly, the material disclosed in Sakaguchi neither anticipates the present invention nor renders it obvious.

Reconsideration and withdrawal of the rejection are respectfully requested.

Claim Rejections Under 35 U.S.C. §103(a) over Sakaguchi in view of Gerber

The Examiner rejected Claims 28-32 over Sakaguchi in view of U.S. pat. 3,783,137 (“Gerber”). The Examiner is relying on Gerber for his teachings of aromatic and heteroaromatic tri- and tetracarboxylic acids.

Applicants submit that there is nothing in Gerber that remedies Sakaguchi’s failure to teach a conducting polymeric material of Claims 25 and 44, i.e. a material that comprises a physical mixture of two polymers, a polyazole polymer and a polyvinyl polymer such.

Reconsideration and withdrawal of the rejection is respectfully requested.

Request for Rejoinder of Groups I, II and III

The Examiner maintained the restriction of the instant invention into two groups, Group I (Claims 25-43 and 50-51) drawn to a proton-conducting polymer, and Group II (Claims 44-46), drawn to an electrode, and Group III (Claims 47-49) drawn to a membrane.

Applicants remind the Examiner that PCT Rule 13.2 requires that lack of novelty of the special technical feature be shown in order for the restriction requirement to be proper. As Applicants explained in their Amendment of September 14, 2006, Claims 25 and 44 share the special technical feature of the material prepared by the sequence of steps (a), (b), and (d) of these claims.

Since the art of record, notably Sakaguchi, fails to anticipate such a material, lack of novelty of the special technical feature had not been properly established and the restriction requirement is improper and should be removed.

Reconsideration and withdrawal of the restriction requirement is respectfully requested.

**CONCLUSION**

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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